



COMDTINST 5200.40
22 DEC 2006

COMMANDANT INSTRUCTION 5200.40

Subj: VERIFICATION, VALIDATION AND ACCREDITATION (VV&A) OF MODELS AND SIMULATIONS (M&S)

- Ref:
- (a) Coast Guard Modeling and Simulation Management, COMDTINST 5200.38 (series)
 - (b) Defense Modeling and Simulation Office (DMSO) VV&A Recommended Practices Guide Build 2.5, <http://vva.dmsomil>
 - (c) DoD Modeling and Simulation (M&S) Verification, Validation and Accreditation (VV&A), DoD Instruction 5000.61 (series)
 - (d) Verification, Validation and Accreditation (VV&A) of Models & Simulations, SECNAVINST 5200.40 (series)
 - (e) Verification, Validation and Accreditation of Army Models and Simulations, DA Pam 5-11 (series)

1. PURPOSE. This Instruction provides policies, procedures, standards, and responsibilities for the Verification, Validation and Accreditation (VV&A) of Coast Guard Models and Simulations (M&S).
2. ACTION. Area and district commanders, commanders of maintenance and logistics commands, commanding officers of headquarters units, assistant commandants for directorates, Judge Advocate General, and special staff offices at Headquarters shall ensure compliance with this Instruction. Internet release authorized.
3. DIRECTIVES AFFECTED. None.

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NON-STANDARD DISTRIBUTION:

4. BACKGROUND.

- a. M&S techniques and tools assist developers and decision makers throughout the acquisition, operational test and evaluation (OT&E), training, and doctrine development process. In particular, M&S capabilities support evaluating requirements, performing trade-off studies, understanding and demonstrating system capabilities and performance, training and educating military and civilian personnel, and developing, assessing, and analyzing operational courses of action. M&S tools are applied in a wide variety of areas and provide valuable insights to reduce uncertainty and risk. As M&S capabilities advance and become more accessible, their use becomes more pervasive in the Coast Guard. To ensure the efficient and appropriate use of this technology, reference (a) defines M&S and directs the issuance of common VV&A practices and enterprise wide policies that maximize the benefits of M&S and reduce the risk of making a faulty decision based upon M&S results.
- b. This VV&A policy leverages many of the DoD best practices outlined in references (b-e) and adapts them into a Coast Guard framework.
- c. Confidence in a particular model or simulation must be justified before its results are used in decisions involving large sums of money, risk to human life, or the possible loss of critical Coast Guard capabilities. To ensure that confidence in an M&S is justified, a rigorous process must be followed, such that:
 - (1) Modeling assumptions are accurate and well documented.
 - (2) Results produced by the M&S are stable, consistent and repeatable.
 - (3) The correlation between the M&S behavior and real world behavior is clearly understood.
- d. VV&A is a process used to ensure that the application of M&S results is appropriate for a specific purpose, e.g., supporting a system acquisition decision, training an operator, or developing tactical mission plans or doctrine. While sometimes referred to as a single process, VV&A consists of three tightly integrated processes that address verification, validation and accreditation of M&S. Verification and Validation (V&V) functions are performed during the M&S development process and are similar in concept to quality control practices in manufacturing. Accreditation is a formal decision to use a specific M&S and its results for a particular application. Properly performed and documented V&V are essential to the accreditation process. However, it is equally essential that the Accreditation Authority understand the scope and limits of the specific M&S capabilities before concluding that these are applicable and appropriate for the intended use.
- e. The formal definitions of VV&A are:
 - (1) Verification is the process of determining that a model or simulation implementation accurately represents the developer's conceptual description and specifications.
 - (2) Validation is the process of determining the degree to which the model or simulation is an accurate representation of the real world from the perspective of the intended uses.

(3) Accreditation is an official determination that a model or simulation is acceptable to use for a specific purpose.

- f. Depending upon where in the M&S life-cycle VV&A is initiated, it may also serve a secondary purpose of risk mitigation, supporting the identification of potential problems or errors as early in the life-cycle as possible. The VV&A process is an integral part of the M&S life cycle, which initiates with requirements definition and includes conceptualization, design, implementation, application, modification, and maintenance.

5. POLICY.

- a. Every Coast Guard M&S within the scope of this Instruction, whether embedded in operational systems, stand-alone systems or integrated with other M&S systems for distributed simulation shall be verified and validated prior to its use. Furthermore, each M&S shall be formally accredited by the appropriate Accreditation Authority prior to using it for an application that meets one or more of the criteria in paragraph 5.c below. M&S meeting these criteria shall be designated as “non-accredited” until the appropriate Accreditation Authority has approved the M&S for the application. Any subsequent use in a new application domain will require a re-accreditation decision. The modification of the M&S for use in the same application domain will require a re-accreditation decision in cases defined by paragraph 7.a.(7).
- b. The Coast Guard’s VV&A process is very flexible. The Accreditation Authority may tailor the process (i.e., accredit with limits, when necessary) to meet specific requirements and objectives while working within existing resource constraints. Additionally, the scope of the VV&A process should be commensurate with a risk-based assessment of the M&S requirements to support a decision versus the proposed M&S capabilities and the possible outcomes of that decision.
- c. Any Coast Guard M&S which satisfies one or more of criteria listed below shall undergo accreditation review for approval by the appropriate Accreditation Authority prior to its use.
 - (1) Any M&S which is used in significantly supporting the development of Coast Guard major acquisitions.
 - (2) Any M&S whose intended use is a primary input to a decision that could impact safety of life.
 - (3) Any M&S whose intended use is a primary input to a decision that could result in the loss of, or significant damage to, major Coast Guard capabilities.
 - (4) Any M&S that will be used for budget formulation or resource determination for presentation or approval external to the Coast Guard, e.g. OMB Exhibit 300 or President’s Budget Submission.
 - (5) Any M&S which the Coast Guard will release or otherwise make available to other DHS or DoD components or contractors, or M&S which will interoperate directly with M&S systems developed outside the Coast Guard.

- d. For those M&S that do not meet the criteria for formal accreditation, the life-cycle management activities outlined in reference (a), including V&V and configuration management shall still be performed in accordance with that policy. The *Special Topics* and *Reference Document* sections of reference (b), the DMSO Recommended Practices Guide, provide guidance on V&V techniques.
- e. Legacy M&S, which are existing M&S that were developed and implemented prior to the issuance of this Instruction, may continue to be used. However, the appropriate Accreditation Authority shall formally accredit those legacy M&S that meet the criteria of paragraph 5.c. For those legacy M&S that do not meet this criteria, the life-cycle management practices described in paragraph 5.d shall be performed from the date of this Instruction.
- f. Independent Verification and Validation (IV&V) is the conduct of verification and validation of a model or simulation by individuals or agencies that did not develop the model or simulation. IV&V does not require complete organizational independence, but does imply a reasonable degree of organizational separation to assure unbiased analysis. IV&V can be a more costly alternative and is not required by this Instruction.

6. ENTERPRISE RESPONSIBILITIES.

- a. The Chief of Staff (CG-01) shall establish and maintain VV&A policies, procedures, and guidelines for M&S applications, standards, and data managed by Coast Guard and is the final adjudicator of all VV&A issues.
- b. The Chief of the Office of Performance Management and Decision Support (CG-0931) shall:
 - (1) Develop a training plan for M&S accreditation.
 - (2) Provide guidance to the Accreditation Authority and M&S Program Manager on the VV&A process.
- c. The M&S Advisory Council shall:
 - (1) When requested, provide a recommendation to the Accreditation Authority on the appropriateness of designating an M&S for formal accreditation in the context of paragraph 5.c.
 - (2) In those cases where there is uncertainty or conflict in the assumption of the Accreditation Authority role, assign responsibilities for the management of this M&S activity. In those cases where the appropriate Accreditation Authority is at the Flag level, the Executive Secretariat, CG-0931, will forward a recommendation to the Chief of Staff for final assignment of this responsibility.
- d. The Program Manager, Coast Guard Research, Development, Test and Evaluation (RDT&E) Program, shall appoint a technical advisor for VV&A activities

7. **VV&A SPECIFIC ROLES AND RESPONSIBILITIES.** Reference (b), DMSO's VV&A Recommended Practices Guide, defines five roles in the VV&A process. It is important to note that one person or organization may be responsible for one or more roles in the VV&A process. Furthermore, this reference contains detailed information on the VV&A process, roles, and responsibilities and shall be adapted and used by all participants in the VV&A effort.
- a. **User/Accreditation Authority:** The **User/Accreditation Authority** is the senior manager or commander that is directly responsible to approve the use of M&S capability for a particular application or the authority responsible for the decisions supported by the M&S capability. The **User** wants to use M&S to solve a problem or make a decision. The **User** defines the requirements, establishes the criteria by which M&S fitness will be assessed, determines what assessment method or methods to use, makes the accreditation decision, and ultimately accepts the results. The **Accreditation Authority** shall:
- (1) Determine the appropriateness of the application of a model or simulation for a particular use. For those M&S that meet the criteria of paragraph 5.c perform a formal accreditation.
 - (2) Identify and document the M&S intended use.
 - (3) Establish Acceptability Criteria for accreditation. The Acceptability Criteria, which are a set of standards that a particular model, simulation, or simulation federation must meet to be accredited for a specific purpose, provide guidelines for the V&V effort.
 - (4) Designate an **Accreditation Agent**.
 - (5) Approve the Accreditation Plan.
 - (6) Make the final accreditation decision of the M&S in writing.
 - (7) When a M&S is maintained for the same intended use, define and provide to the **M&S Program Manager** the modification thresholds that when exceeded shall requires a re-accreditation.
- b. **M&S Program Manager (M&S PM):** The **M&S PM** is the organization, which has primary responsibility for the planning and managing of resources for M&S development, directing the overall M&S effort, and ensuring V&V and configuration management of a particular M&S capability are conducted. The **M&S PM** shall:
- (1) Designate the **Verification and Validation Agent (V&V Agent)** and the **Developer**.
 - (2) Approve the V&V Plan developed by the **V&V Agent**.
 - (3) Update the M&S repository with the Accreditation Decision. Retain the VV&A plans, VV&A artifacts, VV&A reports, and the Final Accreditation Decision.

- (4) Ensure that effective configuration management of M&S is implemented and maintained during and following the accreditation process. This assists with the maintenance of accreditation or follow-on accreditation of the M&S for other uses.
- (5) Notify the **Accreditation Authority** of any proposed modifications exceeding the thresholds described in paragraph 7.a(7) that will require a re-accreditation.
- c. **Verification and Validation Agent:** The **V&V Agent** is responsible for providing evidence of the M&S's fitness for the intended use by ensuring that all the V&V tasks are properly carried out. The **V&V Agent** shall:
 - (1) Produce the V&V Plan for the **M&S PM's** approval.
 - (2) Verify and validate the M&S and associated data according to the V&V Plan. Document the results in a V&V Report.
- d. **Developer:** The **Developer** is responsible for actually constructing or modifying the M&S, preparing the data for use in the M&S, and providing technical expertise regarding M&S capabilities as needed by the other roles. The **Developer** shall support the **V&V Agent** by following the V&V Plan and producing V&V data that supports the plan.
- e. **Accreditation Agent:** The **Accreditation Agent** is responsible for conducting the accreditation assessment. The **Accreditation Agent** provides guidance to the **V&V Agent** to ensure that all the necessary evidence regarding M&S fitness for use is obtained; collects and assesses the evidence; and, provides the results to the **User**, the role with the responsibility of making the accreditation decision (i.e., **Accreditation Authority**). The **Accreditation Agent** shall:
 - (1) Create an Accreditation Plan for approval by the **Accreditation Authority**. The accreditation plan specifies the reviews, testing, and other accreditation assessment processes, as appropriate, needed to certify that the model or simulation has met the acceptability criteria.
 - (2) Communicate V&V data and information requirements to the **V&V Agent**.
 - (3) Perform and document an accreditation assessment in an Accreditation Report for the **Accreditation Authority** to evaluate in determining the M&S's suitability for accreditation.
- 8. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS. Environmental considerations were examined in the development of this Instruction and have been determined to be not applicable.
- 9. FORMS/REPORTS. None.

R.J. PAPP, JR. /s/
Chief of Staff